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" To the solid ground
Of Nature trusts the mind which builds for aye."—WORDSWORTH.

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WATER, WATER, EVERYWHERE.

The Theory of Water Finding by the Divining Rod: its History, Method, Utility and Practice. By B. Tompkins, W.F., author of the "Theory of Water Finding." Second and enlarged edition, with illustrations. Pp. ix + 127. Copyright and all rights reserved. (Published by the author, B. Tompkins, Expert Water Finder, Chippenham, Wilts, 1899.)

BOTH the subject and the method of treatment of the Theory of Water Finding by the Divining Rod, by Mr. B. Tompkins, W.F., are so unlike what are usually met with by those gentlemen whom you, Mr. Editor, honour by a request for a review, and there are such risks of becoming involved in a sort of fourth-dimensional conflict or of giving offence, that I feel the case is one in which the reviewer should write in the first person, and sign his name. Neither the editorial we nor the security of anonymity would, in my opinion, be appropriate.

Mr. Tompkins is a thorough enthusiast; he has discovered that he possesses a power denied to most mortals, and this he practises, so we read in his book, to the great advantage of dwellers mostly in the West of England, in Wales and in South Africa. Evidence of this is given at once in a list, covering seven pages, of patrons, many with handles to one or other end of their names, and of public bodies for whom Mr. Tompkins has found Springs of Running Water.

The divining rod has been known from ancient times, and we are told has been practised for "the tracing of boundaries, murderers, mines, metals, minerals, and hidden sources of water" (mostly things beginning with an "M," as in Alice). "The scientific name given to the art is Rhabomancy."

"The rod is regarded as a symbol of authority, and is often referred to as such in Holy Scripture, and employed in schools. There are, I find, some 130 references to a 'rod,' staff or sceptre as a symbol of power or authority.

Three instances are given in which Moses used a rod with great effect, and Aaron's rod budded. We need not, therefore, be surprised at the success of the Diviner or present Professional Expert Water-Finder.

Mr. Tompkins goes at some length and detail into his own early history and experiences, for which he gives the following excellent reason:—

> "My object in giving a detailed account of genealogy and career is to show that the suppositions made by so many persons, that the Water-Finder is some supernatural being, of a low class, possessing a supernatural power, inherited from a race which existed before the flood mentioned in the sixth chapter of Genesis, caused by the amalgamation of these people, resulting in their possessing occult arts, and from these sprung the Water-Finder, are incorrect and most absurd, absolutely without foundation, they being drowned by the Flood; and further there exists no evidence of a supernatural power, which my readers will see later on."

Here is the account of Mr. Tompkins' discovery of his power of water-finding.

> "Quite alone and in the month of February 1886, one who was destined to become a philanthropist of some repute, and play an important part in the affairs of life, steps forth quite unconscious of these thoughts being in his mind, or that they were really in existence as regard to his future prospects. Like a nest within a nest . . . I lifted my eyes and saw the trees and hedges just showing signs of life; in one I saw a white thorn twig . . . I held this rod by both prongs in both hands, so—" (here is a picture) "gripping it tightly so that it should not move, and commenced to walk in an upright position, with the apex of the twig downward and some distance from the ground. This was in an orchard where there were no signs of water existing or wells near, or any indication that water could be found at one place more than another. After walking a distance of 80 yards or so, I suddenly felt a running or creeping sensation come into my feet, up my legs and back and down my arms which caused me to look to see what had happened. I noticed the rod began to rise in my hands; I gripped it still tighter to prevent it, and kept walking; still I found the sensation get stronger and stronger, and that I was being led in a zigzag course, the twig at the same time exercising a great determination to turn up. So strong had this influence become that I was powerless to keep it down, and eventually after proceeding some distance further it attained a vertical position, and revolved over and over. So great was this sudden and unexpected pressure or influence on me that I fainted and became very ill. . . ."

I may add for the benefit of those interested that Mr. Tompkins recovered, and is now able to undertake Water-Finding with no other ill results than considerable fatigue.

Of course, people whose reasoning powers have chiefly been developed in the school or the laboratory find a great difficulty in understanding how this power of water-finding can be explained, and Mr. Tompkins makes the following observation, with which few will disagree :—

> "The refusal of its acceptance (the gift of water-finding) by some is because scientists have not yet been able to fully explain the marvels, or apparent marvels, in connection therewith, as, if an occurrence that has not been explained by scientific methods, must necessarily be a fraud."

However, this difficulty need not now trouble the public any more because Mr. Tompkins has given a very convincing explanation, which is much more obvious when pointed out than a great deal that is to be found even in these columns or in ordinary scientific books. This is Mr. Tompkins' explanation :—

> "It is a well-known scientific fact that water is a generator of electricity, whether in passing through earth in its natural state or any artificial means employed, creates or produces this power through the various fissures or strata through which it passes. The Expert, medium, or Water-Finder, being, as I have previously stated, of a sensitive nature or organism, the moment he passes over or comes across these currents, becomes the receiving instrument for the time being, and there is no question but that the means used (viz. the Divining-Rod) becomes for the time being a part of the Diviner as an indicator in so far as are the hands of a clock, watch, weather-glass, steam-gauge, or the automatic weighing engine and scales seen so frequently in public places of resort."

Then follow two or three pages, too long to copy, and in which the argument would be lost if only extracts were given, but so novel as to be well worth reading, in which Mr. Tompkins proves conclusively, to himself, that electricity or a magnetic influence really does the work. One sentence is beautifully clear:

> "The rod immediately points in the direction in which the current flows up to a certain spot, when the rod rises to its full height, and because it cannot go higher than a vertical position it revolves over and over again."

It is interesting to follow the scientific method of elimination made use of by Mr. Tompkins when he is finding other things than water. As already explained, the rod will find all manner of things, but a difficulty must be felt in discriminating. This is how it is done. If you are looking for gold and the rod rises, you then put gold in both hands, when the rod will at once fail to indicate anything if it rose for gold, but it will still rise if it rose for water or silver, or murderers, or boundaries, or things other than gold. The same is true for silver. We can only infer that the murderer can be discriminated by putting a murderer in each hand, but this is not stated. At any rate, Mr. Tompkins proves the gold story by explaining how he found a sovereign under the floor when the Bath and West of England Show visited Gloucester.

While on the scientific explanation of the action of the divining rod, it may be worth while to refer to an article by Mr. John Wallis Mulcaster, late Fellow of the Royal Astronomical Society, and late Member of the London Mathematical Society, quoted by Mr. Tompkins. This gives a good many more details in the proof of the electrical relationship of the divining rod than Mr. Tompkins employed in his more general type of reasoning. He begins :

> "All minerals and water, more or less, emit an effluvia, composed of minute particles or physical atoms, of the substance they represent." . . . (Then follows an explanation of the reason why the depth can be judged). . . . "On arrival at the surface of the earth, those minute particles of metal, &c., having a tendency to ascend in vertical lines, the superincumbent air has also a tendency to press them down, whilst the particles are continuously driven forward by those that follow them. Now the divining rod being composed of a porous and fibrous substance, it follows through the natural order of things, that the physical atoms or minute particles of metal being driven up and down by opposing vertical forces, enter the interstices of the light porous wood, which gives them an easy passage."

This, of course, explains why the rod gets parallel to the ascending atoms so clearly that the non-scientific countryman would understand it as well as and perhaps even better than a trained physicist. Mr. Mulcaster goes on to show why it is only running water that will act on the twig, stagnant water being no good, but he has not explained why stagnant metals work. I do not feel equal to the task of supplying the omission with confidence, but on the whole it seems most likely that it has to do with "the natural order of things." Mr. Mulcaster is well aware in conclusion that in his lengthened remarks he has exploded certain ideas hitherto held on this subject for generations, and that the "electro-corpuscle" theory provides the explanation of the so-called mysterious action of the divining rod.

Perhaps enough has been written to give a fair idea of the style and scientific merit of Mr. Tompkins' book. The subject, however, should not be dismissed here. There is no question but that a large number of people of every class, except, perhaps, the purely logical, if there is such a class, are firmly persuaded that the Professional Expert Water-Finder with his Divining Rod can and does find water where ordinary folk, including geologists, fail; and what is more, that in quite a limited locality will, where sinking has failed to produce useful results, make their examination, find no water where failure has resulted, yet within a few yards assert that abundant water is to be found, which is verified on trial. Mr. Tompkins says the subject must be approached with an open mind, and he refers occasionally to X-rays and spiritualists. I hope in the following observations that I shall appear to have done so with a mind sufficiently open, but not gaping open so wide as to be practically turned inside out, a state which at any rate is conducive to sport when chasing spooks guarded by impostors.

Mr. Tompkins, who in many respects appears to be a very able exponent of the Diviner's Gift (not Art) explains how in walking over the ground he feels a sensation, a faculty possessed by only very few people, when he comes to the neighbourhood of running water, and that this sensation gets stronger as he approaches the "Head of the Spring," so that without any stick at all he could be guided to the best place for sinking for water. Further, that the sensation enables him to judge the depth as well as the quantity of water which is to be obtained. The twig serves as a kind of indicator; it is not absolutely essential, but he prefers to go to work in the recognised way; he believes "using a rod is the most successful and satisfactory to the public." So he cuts a forked stick of white thorn or hazel, as he finds these woods best. Ash is too sensitive, oak too sluggish, so the depth is over- or under-rated with these woods, while willow is too soft, so that it turns too easily and becomes useless. The depth of the water is estimated from the

> "action or velocity of the rod and the amount of pressure upon the body . . . the yield by the strength and number of strata or streams which converge to the Spring Head. . . . The principle of its action is as a steam gauge on a boiler or engine, indicating the amount of pressure of the steam."

Mr. Tompkins apparently is convinced of the certainty of the method, for he says

> "I should like to mention the fact that I have never had an engagement in which I have not found a spring if one existed."

Mr. Tompkins cites X-rays as an instance where a genuine physical agent exists where only a few years ago such action would have been considered impossible by scientific men; why, therefore, should there not be an emanation or "an effluvia" from the running water which might be detected by a sensitive person? I will make Mr. Tompkins a present of another analogy even more to the point. Gravitation, which on a large scale is of the most stupendous importance, so much so that even chemical energy sinks into insignificance by comparison, is yet so feeble when exerted between moderate quantities of matter that it could never have been discovered in the laboratory, and even now, with all our delicate instruments, is not provided against as a disturbing factor. By specially refined means, however, it can be detected and measured in the laboratory. Why should there not be an influence rising vertically from running water which we cannot detect in the laboratory, but which a few sensitive people might feel? We know that quite ordinary people can detect and be greatly affected by the difference in the air of two neighbouring places—one bracing, one relaxing—which cannot be directly traced to a chemical or physical cause. Again, it is maintained that there are people who are instantly aware if a cat is in the room, even though no one in the room may have seen or heard it, and who cannot remain unless the poor beast is removed. I am not referring to those who only find this out after they have seen the cat; that is merely an excess of affectation which should have been spanked out of them when they were young. The first sort, if they really exist, are certainly incredibly sensitive and are far more worthy of being considered supernatural beings than even Mr. Tompkins, if we may judge him by his book. It is hardly logical, therefore, to assert that a specially sensitive person cannot possibly be affected by the existence of water near or below him, but it is very difficult to see by what process the emanation is constrained to move vertically. Any one would have expected that if the "Spring Head" were, say, 50 feet down, there would be a greater effect upon the diviner at, say, 10 feet away from the vertical, but upon the ground, than exactly over it, and, say, 20 feet above the ground; but no, for Mr. Beaven, of Hereford, in a letter quoted, states that Mr. Tompkins in one case located a spring when on the top of a monument, while in another case he actually

> "had to climb to the top of a haystack to locate the exact spot where a downward shaft would disclose the spring."

Again Mr. Tompkins on one occasion, much to the surprise of the owner, found indications of water crossing under a lawn where as a fact a water-pipe had been laid. Do the effluvia escape through the metal, or did Mr. Tompkins feel the presence of the metal itself? One of Mr. Tompkins' strongest arguments is that he adopts the professional custom of the water-finder, which is "No water, no pay," even though, to use his own words,

> "to-day his name stands boldly before the British Public—in fact absolutely alone—as the only discoverer and guarantor of the 'Head of the Spring.'"

There seem really to be two questions: (1) Can the water-finder by his sensations, whether with or without a divining rod, indicate the position and yield of a hidden spring without employing any knowledge of geological conditions or experience as to the lie and appearance of the land? (2) if so, has the divining-rod anything to do with his success? Of course, if he succeeds in consequence of mere reasoning based upon geological knowledge or experience, while none the less useful to the public, he is, as far as divining is concerned, a fraud.

Reasoning beings would require very strong evidence to be absolutely satisfied that the first question can be answered in the affirmative. Yet a gentleman known to me personally, with mechanical and scientific ability and plenty of common sense, is persuaded from what he has seen that a water-finder (in this case not Mr. Tompkins) can locate hidden water, and that he does so by feeling a sensation. This water-finder asserts freely that the divining-rod has nothing to do with the business at all. This gentleman's son, formerly a student at the Royal School of Mines, now a professional engineer, in whose ability and honesty I have absolute faith, went round with the water-finder, and noticed that he, too, was cognisant of some sensation when the water-finder found indications of water. Mr. Tompkins quotes, and I suppose correctly quotes, a letter from the Chairman of the Quarter Sessions for Herefordshire to the *County Council Times*, in which he states that out of curiosity he went round with a water-diviner and found that he could use the rod successfully himself. While he has no occasion to do this professionally, he now uses it to discover leaks in the embankment of a large piece of water on his estate caused by rats or rabbits which he could not easily find otherwise. Scores of examples might be given.

As I have stated, it does not seem a logical position to take up to say that the gift as distinct from the art is impossible, even though we may require a better quality rather than quantity of evidence than is available to be satisfied as to its reality. But the gift, if it exists, is not sufficiently dramatic to impress the public. It is here, to my mind, that the rod comes in. The forked twig, held as it is, can be made to rise, fall or rotate by an almost imperceptible movement of the hands, possibly after a time unintentionally on the part of the water-diviner, and the public is impressed. For the same reason it may be well to find that water can only be met with in some inconvenient position, such as under a haystack or the cellar of the house, or the corner arch of a large granary. Ignorant and credulous people will have much more faith in you if you put them to a little inconvenience.

If the water-finders would leave it here, there could be no cause of complaint, provided, of course, that they succeed where geologically trained people fail. But when they put forward preposterous "scientific explanations" such as I have extracted, it makes it very difficult not to come to the almost inevitable conclusion that the water-finder has no case, and that the surcharging of his fees by auditors is necessary for the protection of public bodies. Perhaps among the 130 references in the Bible to the rod, staff or sceptre already referred to is this, "a whip for the horse, a bridle for the ass, and a rod for the fool's back."

C. V. BOYS.

HISTORY OF THE ART OF EXPERIMENTING.

Geschichte der Physikalischen Experimentierkunst. Von Dr. E. Gerland und Dr. F. Traumüller. Pp. 427. (Leipzig: Wilhelm Engelmann, 1899.)

THIS work, illustrated by more than four hundred woodcuts, gives a most interesting account of the apparatus used and of the investigations made by scientific inventors from the earliest times at which records exist down to the invention of Morse's printing telegraph in 1843.

One of the most interesting things that appears on the face of this history is the great mechanical ingenuity of many of the inventors of ancient times, as, for example, Hero of Alexandra, who invented a penny-in-the-slot machine, and the almost entire absence of any attempt to carry out what we would now call an experimental investigation. The experimental investigation of natural phenomena is extraordinarily modern, and the looking for mere rules of sequence in the phenomena rather than transcendental souls, spirits, effluvia, and such like efficient causes, is still more modern. This history covers a period of some four thousand years; but experimental science of the modern type is not more than three hundred years old. It is only amongst scientific men that the nature of experimental inquiry has been appreciated for as long as three hundred years. The well-educated man has not appreciated its nature for more than fifty years, and it is only within the last few years that in Britain the characteristic nature of experimental science has been at all generally understood. Even now a person is considered well educated who does not understand how to learn from experiment and observation to regulate his life. As a consequence, many so-called well-educated persons make awful fools of themselves.

In addition to the history of the subject, there are in connection with each period interesting *résumés* of its peculiarities, and of how it was an advance on its predecessors and yet did not attain to the position of subsequent workers. For example, attention is called to the way in which Gilbert, though in many ways imbued with the modern spirit of experimental inquiry, was still so dominated by the notion that magnets were possessed with some sort of soul or spirit that he cannot be rightly classed amongst the moderns, but is a sort of connecting link between them and mediæval superstitions.

There are two interesting questions that are not solved. One concerns the connection between Archimedes' observation in his bath, the method he employed to discover the amount of alloy in King Hero's crown, and the principle he enunciates in his writings as to the loss of weight of bodies immersed in a liquid. There seems no doubt from the description of the experiments he made (by observing the rise of water in a vessel when gold and silver were immersed in it) that he did not use weighings at all in his determination of the alloy in the crown. It would be interesting to know how he then discovered the amount of loss of weight of a body immersed in a liquid. What set him on observing this? The question is the more interesting in that most of the scientific workers of that age seem to have confined themselves to solving practical difficulties in the way of carrying out some project they had in hand, and were not at all imbued with the modern spirit of experimental research. The other question that needs elucidation is as to the observation of the Florentine Academicians that water could penetrate gold. This experiment used to be very commonly quoted to prove the ultimate porosity of solids, but it does not seem to have been repeated, and there are very grave doubts as to the genuineness of this penetration. It seems much more likely that the gold cracked, and that the Florentines did not observe this.

It has several times happened that all the necessary principles involved in subsequent inventions have been discovered, and attempts made to apply them long before the inventions were brought into actual use. In most cases it seems to have been the want of means or of push of the inventor that prevented him from getting his invention into use. There is a generally received notion that this want of success has been usually due to want of practical ability to get over difficulties that arise in actual use. This seems to have been true to only a very small degree. A very remarkable instance of an old invention coming into use is that of heat engines. Hero of Alexandria invented several forms of heat engine, including that latest development of steam engines a turbo-motor; yet it was only during last century that any serious use was made of them, unless imposing on the worshippers in Egyptian temples can be called a serious use. The rate of evolution of the steam engine has been most remarkable. Invented by Hero, it languished in an amœboid condition for many centuries, and then within two hundred years it developed into its present highly organised family of many genera and species. If a future geologist were to exhume the remains of steam engines, and were to have some means of determining the ages that elapsed between Hero's engines and that of Savery, and from these data were to evolve a chronology of the recent developments, he could hardly avoid concluding that it took at least a million years to develop the engines of a modern steamship from Savery's engine. Many other forms of engine have been proposed. Huygens' gunpowder engine